Under Section 2.3.1 Construction and Redevelopment

Site-Wide Water Balance

A site-wide water balance (SWWB) model was developed for the SGP to account for water production, usage and reuse, consumption, handling, and storage throughout the mine construction, operations, and early closure periods (BC 2018c). The SWWB model was constructed using GoldSim™, an object-oriented dynamic system modeling software, to simulate the SGP's complex water balance and water management systems. The SWWB estimates stormwater volumes produced during construction, mining, and post-mining reclamation; contact water resulting from runoff and seepage through mine facilities, volumes of tailings solids and water stored in the TSF, and the volume of water required for ore processing.

The SWWB uses output from the Proposed Action Hydrologic Model (BC 2018a) to estimate dewatering rates for mine pit development and a supporting spreadsheet-based meteoric water balance model (BC 2018a) to predict precipitation runoff and infiltration rates for the DRSFs and runoff from open pits. The hydrologic model combines the meteoric water balance with a numerical groundwater and surface water flow model developed using MODFLOW-NWT, described in detail in the Hydrologic Model Existing Conditions Report (BC 2018b). The SWWB uses the groundwater dewatering withdrawal rates calculated by the hydrologic model to provide an estimate of the amount of fresh water that would be obtained from groundwater sources.

The SWWB simulations include 2 years of construction, 12 years of operations, and 20 years of post-closure conditions. Consistent with the hydrologic model simulations, three model scenarios were developed to simulate average, below average, and above average precipitation conditions during construction and operations to predict the potential variability in water volumes. For the SWWB, the "below average" and "above average" scenarios used respectively the driest and wettest 14-consecutive-year periods from a 122-year climate dataset, while the "average" scenario used a 14-year period that had an average annual precipitation equal to the long-term average.

The SWWB consists of five primary water balance components (Figure 1): ore processing; TSF; contact water from pits, DRSFs, and process areas; dewatering for pit development; and potable water supply. Secondary water balance components associated with each of the primary components are described below (dust suppression, discharge to rapid infiltration basins [RIBs], etc.) The SWWB components are shown on Figures 2 through 4 along with the estimated average water inflows and outflows for each component for mine years -1 (construction), 7 (operations) and 18 (closure). Additionally, diversion channel flow rates for the construction, operations, and closure periods calculated by the Proposed Action Hydrologic Model are shown on Figures 2 through 4. Diversion channel flow rates during the construction and operational period shown in Figures 2 and 3 are the annual average of the 14 years of construction and operations. Diversion flow rates for closure are the annual average rate for year 18 from the Proposed Action Hydrologic Model.

Commented [HL1]: This comment applies generally to the description of RIBS and other documents referencing the RIBS. We reiterate that we request clarification regarding the RIBs related to surface water quality and management. In addition, the response to EPA comment #6 on the SWWB states that the hydrologic model is unable to predict single molecules of water and that "…a relatively short physical distance ranging from tens to hundreds of feet between the RIBs and Meadow Creek, an individual particle of water could hypothetically travel from the RIBs to Meadow Creek in a few days to many weeks or even months." Discharge from the RIBS to surface water given the proximity and short travel time would likely be considered a direct hydrologic connection and therefore, subject to CWA/NPDES permit authorities. In addition, it is unclear which sources of water would be infiltrated through the RIBs. Please clarify the sources and discuss if or how RIBs would comply with the CWA/ permit limits (e.g., new outfall?).

Calculated flow volumes were based on data from the meteoric water balance model, which accounts for precipitation, sublimation, evaporation, and evapotranspiration; therefore, these amounts are not explicitly shown on the figures. The figures provide linkages between SWWB components, with color coding to distinguish the various types of water, including fresh water, contact water, ore moisture, process water, tailings slurry, and domestic water. Freshwater flows include dewatering for pit development, potable water, stream diversions, and stormwater diversions around the mine features. Contact water flows include stormwater and snowmelt runoff from mine features such as the DRSFs and mine pits, toe seepage from the DRSFs, and potentially underground exploration water (if these features intersect mineralization). Ore moisture consists of moisture contained in the ore. Process water consists of water used in ore processing and includes precipitation that falls directly on the TSF. Tailings slurry consists of process water mixed with the tailings that is piped from the ore processing facility to the TSF. Domestic water includes potable water used and sanitary sewage generated at the Worker Housing Facility, mill, administration buildings, and truck shop.

Ore processing is central to the SWWB as it is the primary driver for SGP water demands and has inflow and outflow linkages to the TSF, contact water, and pit dewatering components. Inflows to the ore processing component include fresh water from pit dewatering, contact water, TSF reclaim water, and moisture from ore and the reprocessed Bradley tailings. Outflows from ore processing include tailings slurry conveyed to the TSF and process losses.

Inflows to the TSF include tailings slurry (solids and water), precipitation, leakage from surface water diversions around the TSF, and runoff pumped to the TSF from the Bradley tailings reprocessing operation. The TSF will store tailings solids, water entrained with the tailings, and free water atop the tailings. Outflows from the TSF include evaporation and reclaim water pumped from the TSF back to the ore processing operation.

Inflows to the contact water component of the SWWB include DRSF runoff and toe seepage, pit wall runoff, water from underground exploration activities, and direct precipitation on contact water storage ponds. Outflows from the contact water component include makeup water for ore processing, evaporation, dust suppression in mine pits and on DRSFs, and water discharged following treatment, if necessary, which would be regulated by a National Pollutant Discharge Elimination System (NPDES) permit.

Inflows to the dewatering component of the SWWB are from dewatering wells. Outflows from the dewatering component include makeup water for ore processing, dust suppression use, and discharge to RIBs or surface outfalls to be determined based on water quality and permitting considerations.

The potable water component of the SWWB is an independent circuit that does not interact with other components of the SWWB. Inflow for potable water is from an anticipated groundwater well or wells. Outflow from the potable water component is to domestic and office use, and ultimately to domestic wastewater treatment and discharge, which would be regulated by an NPDES permit.

Surface Water Management

Midas Gold would install and maintain water management infrastructure at the mine site to prevent perennial, intermittent, and ephemeral streams and stormwater from encountering mining facilities (Figures 5 and 6) by temporarily diverting non-contact water around site features during the life of the mine to "keep clean water clean." Meteoric water that encounters mining facilities (mine pits, DRSFs, spent heap leach ore and tailings from past mining operations, ore stockpiles, etc.) is considered contact water with the potential to introduce increased levels of sediment, metals, and other possible contaminants into groundwater and surface water. To mitigate these potential impacts, Midas Gold would implement water collection and treatment measures during construction, operations, and closure to meet applicable NPDES permit limits prior to discharge to the environment. In addition, when practical, contact water would be recycled to the ore processing facility or used for dust control, thereby reducing freshwater requirements.

Commented [MP2]: General Comment. It would be helpful to include figures in this document rather than expecting the reader to find the information or interpret it from other documents. Figures and flowsheets will greatly help with understanding surface and contact water flow paths and management steps.

The stream diversion channels and other water management features would be constructed and managed to keep non-contact water separate from contact water and process water. Installation of the water management infrastructure would be phased, to the extent practicable, to coincide with the expansion of the mine. Generally, the mine facilities that expand during the Project life (i.e., pits, DRSFs, and TSF) would be served by two types of surface water diversions: (1) major diversions of the principal waterways (i.e., Meadow Creek and tributaries at the TSF, Fiddle Creek at the Fiddle DRSF, EFSFSR at the Yellow Pine pit, etc.) and (2) minor diversions of hillside runoff and seeps. The major diversions may (e.g., Meadow Creek) or may not (e.g., EFSFSR) be phased with facility expansion and, if phased, would not necessarily be rebuilt with every expansion but rather rebuilt at a higher elevation likely once during operations. Minor diversions, typically berms or V-ditches used to manage nuisance hillslope runoff originating below the elevation of the major diversion, would be phased and rebuilt frequently as facilities expand—potentially annually in the case of DRSFs and with each liner expansion in the case of the TSF. In both cases, the phased diversions would be within the permitted disturbance for the facility. Similar diversion channels would be installed to intercept and divert hillslope runoff around mining areas, ore processing infrastructure, growth media stockpiles, and other mining features.

Midas Gold would install BMPs and employ mitigative measures to reduce erosion and fine sediment delivery to streams during construction, operations, and closure. These BMPs would include, but are not be limited to, sedimentation ponds, diversion ditches/trenches/berms, runoff water collection ditches, silt fencing, water bars, culverts, energy dissipation structures, and terraces.

Midas Gold would also capitalize on opportunities during the initial site cleanup, mine development, operations, and closure to restore and enhance wetlands, riparian habitat and stream channels and to improve water quality throughout the Project area consistent with the Payette National Forest Final Forest Plan Revision (USFS 2003), and the Boise National Forest Land and Resource Management Plan, 2003-2010 Integration (USFS 2010). As part of the initial site cleanup, certain waterways impacted by contact with historical mine workings and legacy mining-related waste would be moved from their current locations and realigned. During operations and closure, measures would be taken so that the site is left with a self-sustaining natural ecosystem, enhanced habitat for the natural fish and wildlife populations, and improved water quality.

Stream Diversions

The SGP is located within the upper reaches of the EFSFSR, and several streams flow through the Project area. Impacts to streams would be minimized through installation of temporary stream diversions, water management features, and BMPs designed to reduce erosion and fine sediment delivery to the streams. Most of the streams that would be affected by the SGP would either be diverted during mining operations and then restored once operations have ceased or enhanced in place as operations shift within the Project area. Many of these stream diversion channels would also serve to intercept and divert clean stormwater runoff from areas upslope of the mine features as described in Section X.X. Once mining operations are completed, the streams would be restored (as described in Section X.X) to conditions that are beneficial for fisheries and aquatic life. In addition, certain sections of streams that have been impacted by historical mining activities would be restored or enhanced to improve fish habitat and passage. Stream enhancements include removing local barriers to fish migration, restoring riparian vegetation, installing habitat improvement features (e.g., woody debris, boulders, etc.), and reestablishing active floodplains.

The proposed stream diversion and water management features are shown on Figures 7 through 26, are described below, and include the following:

- The EFSFSR would be diverted around Yellow Pine pit, and the existing pit lake would be drained prior to operations. The pit would later be backfilled and the EFSFSR restored across the backfilled pit. The EFSFSR would be enhanced above the pit to the confluence with Meadow Creek.
- West End Creek would be diverted and later restored as part of water management for the West End pit and DRSF.
- The lower reaches of Midnight Creek would be diverted and later restored as part of Yellow Pine pit water management.
- Fiddle Creek would be diverted around the Fiddle DRSF and then later restored.
- The lower reach of Hennessy Creek would be diverted around the Yellow Pine pit, then later restored to reconnect to the EFSFSR atop the backfilled Yellow Pine pit.
- Culverts would be installed on the lower reaches of Garnet Creek and later removed.
- Groundwater levels would be restored in the upper meadow (upstream of the failed former dam) of the East Fork of Meadow Creek (aka Blowout Creek), and an engineered channel and rock drain would be constructed in the lower reaches below the meadow. The rock drain would be replaced by a restored surface channel at closure.
- The lower reach of Meadow Creek to its confluence with EFSFSR will be enhanced and the middle reach of Meadow Creek would be diverted around Hangar Flats pit in an ecologically functional stream and floodplain corridor.
- The upper reach of Meadow Creek would be diverted and later restored as part of the TSF and Hangar Flats DRSF water management.

The stream diversion channels would be sized to convey peak flow based on a recurrence interval appropriate to the risk level of the facility, in recognition of other water management measures and fail-safes in place (e.g., excess flood storage and freeboard in the TSF, etc.), and in accordance with regulatory standards. The channels would be protected against erosion using a combination of adequate channel dimensions, appropriate gradient, and riprap and other lining materials.

Commented [MP3]: Recommend that the final version of this document provide the specific peak flow design criteria for each of the diversion channels. This could be presented in a table.

Most of the temporary stream diversion channels would be one of two general types: (1) rock-cut channels along steep slopes and in areas with shallow or at-surface bedrock or (2) excavated channels and berms constructed of alluvium or colluvium. Channel segments constructed in erodible materials would be lined with riprap, where needed, to prevent erosion. The rock-cut channels would be non-erodible and not require riprap lining. Channel segments constructed over fill or excavated in permeable materials would be lined with a geosynthetic liner (e.g., high-density polyethylene [HDPE], linear low-density polyethylene [LLDPE], or geosynthetic clay liner [GCL]) to prevent seepage where it would create water quality problems, undesired loss of water, or geotechnical instability (such as atop the DRSFs at closure, or within the groundwater drawdown influence of pits during operations). If a geosynthetic liner is used, a bedding layer may be placed under the liner if needed, and a transition layer of sand/gravel followed by riprap would be placed over the liner for erosion protection. Some channel segments (particularly the outfall chutes) may be lined with geocomposite products, such as HydroTurf (a composite of HDPE, engineered turf, and concrete binder) only, which combines erosion protection and seepage prevention in a single product.

Stream diversion segments anticipated to be constructed with a geosynthetic liner during operations include the non-rock-cut segments of Fiddle Creek and West End Creek around the DRSFs and West End pit and Hennessy Creek (if the stream is not diverted into the EFSFSR tunnel) along the legacy development rock dumps. Midnight Creek would not be lined during operations. Restored segments of several streams would be constructed with a geosynthetic liner, including Fiddle Creek and West End Creek on the DRSFs and Midnight Creek and Hennessy Creek within the limits of the restored EFSFSR floodplain.

The temporary diversions may use a shorter-longevity liner material than the permanently restored stream channels or may have liner directly in contact with the water column (i.e., no overliner streambed material). Alternative approaches may include thinner materials; different materials such as reinforced polyethylene (fPP-R) or HydroTurf; or different approaches such as grouting in the case of rock cuts. Some channel segments may be naturally impermeable or at the same level as groundwater, and not require lining.

Figures 27 and 28 show typical channel cross sections. Channels constructed in rock would generally have a wall slope of about 0.5H:1V (Figure 27), and channels constructed in alluvium or colluvium would have walls with a maximum slope of about 1.5H:1V (Figure 28). Where required for stability of the channel lining, the slopes within the flowing portion of the channel (as opposed to the cut slope above the high-water line) would have slopes of 2.0H:1V or flatter.

Channel gradients would be variable, depending on site conditions but would be sufficient to ensure continuous water flow in the diversion at velocities not exceeding the allowable velocities for the selected channel lining material. Diversions on sidehills, such as around the TSF and DRSFs, would have slopes ranging from 0.5 to 2.0 percent. Diversions at other locations would follow the general gradient created by the facility configuration (e.g., groins of DRSFs, outfall chutes down sidehills, roadside ditches) and/or its interaction with adjacent native ground and may be steep (10 to 50 percent). The Meadow Creek diversion around the Hangar Flats pit would be at the approximate valley gradient, as modified by any meanders or habitat features introduced into the design.

The stream diversions would generally be constructed just before first mining a pit or placing the first development rock within a DRSF, but the onset of winter or spring runoff may require adjustments to the schedule of up to a year or more. Streams would be diverted into the diversion channels by constructing a temporary flow barrier such as a diversion berm or cofferdam to redirect flows from the existing streams into the diversion channels. Additional protection, such as riprap or energy dissipation structures, may be needed at the channel entrances and exits to ensure velocities do not scour the existing streambed or bank. Where needed, trash racks or similar debris removal structures would be installed at the channel entrances to prevent large wood and other debris from entering the channels.

Commented [GC4]: It is unclear if this is suggesting that they may mine without diverting a creek first or place dev rock in a stream for disposal? Stream diversions should always be done before pits or storage facilities are constructed to avoid impacting/treating more water than necessary.

To help ensure the stream diversions are completed in a manner protective of fish inhabiting the streams, Midas Gold would develop a plan for isolating channel segments, dewatering, and salvaging and relocating fish during dewatering or maintenance of natural stream channels and diversion channels. Stream segments to be dewatered could be isolated using a variety of methods as appropriate for the circumstances. The potential effects of sediment discharge from the dewatering would be assessed and controls would be installed as needed to reduce stream turbidity and sedimentation of the downstream receiving streams.

All temporary dewatering and diversion efforts for activities such as stream repair, culvert maintenance, or temporary stream impacts from other mining activities would have the proper fish exclusion screening, or other method, to minimize the risk of fish becoming entrained in the pump and/or diversion. Diversions around the DRSFs, TSF, or other multi-year mine activities would be assessed on a case-by-case basis for whether fish exclusion is necessary based on the diversion structure, channel dimensions, and likely fish presence.

EFSFSR

The EFSFSR is the principal surface water drainage of the SGP site. The drainage has been heavily impacted by historical mining-related activities, and the EFSFSR receives flow from several additional impacted streams flowing through the SGP site. The EFSFSR flows through the historical Yellow Pine open pit, which has been a barrier to fish passage since the initial excavation of the pit in 1938. Redevelopment of the Yellow Pine pit would require temporarily diverting the EFSFSR around the pit.

During initial site restoration, construction, and development, Midas Gold would construct a tunnel to temporarily divert the EFSFSR around the west side of the pit (Figure 29). The tunnel would be approximately 0.8 miles long, 15 feet high, 15 feet wide, and have capacity to handle a 500-year flood event. The tunnel would feature a low-flow channel to facilitate upstream and downstream fish passage and to allow maintenance access during low-flow conditions (Figure 30; McMillen Jacobs 2018a, 2018b). Management of groundwater inflows into the tunnel and water used for tunnel construction (production water) is described Section X.X.

The EFSFSR tunnel, including transition channels at the portals, would be constructed and maintained to foster both upstream and downstream fish passage. Low-energy lighting would be installed in the tunnel and set on timers to simulate daylight. A trash rack would be constructed at or near the entrance to the tunnel to prevent large wood and other debris from entering the tunnel. The spaces between the trash rack bars would be sized to allow passage of adult Chinook salmon.

The low-flow section of the tunnel would incorporate structures, arranged to produce hydraulic conditions (depth and velocity) that can be successfully navigated by fish, and pools that would provide quiescent zones where fish can rest following periods of exertion.

To support construction of the tunnel, Midas Gold would utilize office and safety trailers, portable shop and compressor facilities, shotcrete facilities, ventilation fans, and lay-down areas for underground equipment and supplies. Underground construction support facilities would be removed once the tunnel is completed and commissioned. Upon removal, the area where temporary tunnel construction support facilities were placed would be reclaimed or used for stockpiling reclamation materials.

At closure, the tunnel portals would be closed and the EFSFSR would be reestablished in a lined stream channel over the backfilled Yellow Pine pit as shown on Figure 31 and described in Section X.X.

Fiddle Creek

Fiddle Creek is a small tributary that joins the EFSFSR a short distance upstream from the Yellow Pine pit. Fish passage up Fiddle Creek is currently cut off from the EFSFSR because of road construction, culvert installation, and a steep natural gradient. In addition, the drainage was the site of a legacy water storage reservoir that has left a portion of the stream in an unnatural state.

Construction of the Fiddle DRSF would require temporarily diverting the stream around the perimeter of the DRSF using surface water diversion channels to avoid contact with the development rock (Figure 32). The stream diversions would consist of a rock-cut channel in segments along the steep hillside above the DRSF and an excavated channel and berm in segments through alluvium or colluvium. Channel segments excavated in erodible or permeable materials would be lined as required with rock riprap and/or geomembrane or a geosynthetic liner to prevent erosion and to minimize seepage.

Once the Fiddle DRSF is completed, the stream would be reestablished across the top of the DRSF and would report back to the natural drainage downslope of the DRSF as described in Section X.X.

West End Creek

West End Creek is a tributary to Sugar Creek, which enters the EFSFSR downstream of the SGP site. The drainage has been heavily impacted by legacy mining and mining-related activities, including development rock deposition over the stream channel, diversion of the stream into a French drain, and mining out portions of the stream channel. The stream currently flows approximately 2,800 feet through the French drain under the existing legacy development rock dumps and is impassable to fish due to the French drain and steepness of the terrain.

Development of the West End pit would require temporarily diverting West End Creek around the proposed pit and West End DRSF using a surface water diversion channel similar to that proposed for Fiddle Creek. Diverting the stream away from the French drain and legacy development rock dump and the active mining operations would improve water quality entering Sugar Creek and the EFSFSR.

The stream diversion would temporarily redirect West End Creek around the north side of the legacy West End development rock dumps, West End pit, and West End DRSF (Figure 33). The diversion would consist of a rock-cut channel in segments along the steep hillside above the West End pit and DRSF and an excavated channel and berm in segments through alluvium or colluvium. Channel segments excavated in erodible or permeable materials would be lined as required with rock riprap and/or geomembrane or a geosynthetic liner to prevent erosion and to minimize seepage. A portion of the channel may include segments of pipe over steeply sloping terrain during operations to minimize the potential for erosion in those areas, and to avoid historically mined, disturbed areas.

Once the West End pit is mined out, wetlands would be constructed on the surface of the reclaimed West End DRSF and West End Creek would be reestablished to feed the wetlands (Figure 34) as described in Section X.X. Remaining West End Creek flow would discharge to the West End open pit, forming a small lake in the northern portion of the pit referred to as the West End pit lake. Precipitation and surface runoff would result in a second small lake forming in the southern portion of the pit, referred to as the Midnight Area pit lake. Groundwater modeling to date indicates that the lakes would eventually fill and spill over into West End Creek and Meadow Creek. A hardened spillway and stream channel would be constructed on the lower legacy rock dump to provide a future connection from the pit lake to the existing lower reach of West End Creek.

Hennessy Creek

The lower portion of Hennessy Creek has been significantly impacted by legacy mine-related activities and infrastructure, including diversion of the stream for use in mining operations, and road construction that buries the stream channel. The stream currently flows through a series of existing diversion channels along Stibnite Road, along the west side of the Yellow Pine pit, with low flows seeping through legacy development rock dumps to the EFSFSR and existing Yellow Pine pit lake and high flows ultimately discharging down a steep embankment to join the EFSFSR below the Sugar Creek confluence. Redevelopment of the Yellow Pine pit would require temporarily diverting Hennessy Creek to prevent the stream from entering the pit.

Midas Gold would temporarily divert Hennessy Creek around the Yellow Pine pit using a surface water diversion channel (Figure 35). The stream diversion would temporarily redirect Hennessy Creek west of the current road and discharge to the EFSFSR north and west of the Bradley dumps. The channel segment upgradient of the Bradley dumps would be lined with geosynthetic (HDPE, LLDPE, or GCL) to prevent seepage into the dumps. The diversion channel would have the added benefit of intercepting and diverting stormwater runoff from the hillside above the road around the Bradley dumps, preventing it from passing through the dumps.

At closure, Hennessy Creek would be restored as described in Section X.X. The stream would flow over the west highwall of the Yellow Pine pit through an unlined chute into a reconstructed channel atop the backfilled pit and into the restored EFSFSR.

Midnight Creek

Midnight Creek has been impacted by legacy mining activities, including open-pit mining, development rock dumps, and road construction. The stream currently flows across legacy development rock dumps and into the existing Yellow Pine pit lake. There is currently no fish passage up Midnight Creek. Redevelopment of the Yellow Pine pit would require diverting the stream into the EFSFSR upstream of the proposed tunnel.

A surface water diversion channel would temporarily intercept the lower portion of Midnight Creek near where it currently flows into the Yellow Pine pit and divert it toward the south, through a piped section under a growth media stockpile, and to the EFSFSR upstream of the tunnel portal (Figure 6). The diversion would be excavated through colluvium and glacial materials, or piped as described above.

The diversion would manage flows in Midnight Creek during Yellow Pine pit operations and backfill activities until the EFSFSR is realigned over the backfilled pit. At closure, Midnight Creek would be restored as described in Section X.X and reconnected with the restored EFSFSR channel near the upstream end of the backfilled Yellow Pine pit.

Garnet Creek

Garnet Creek has been impacted by legacy mine-related infrastructure across and adjacent to the stream channel, including portions of the historical townsite. The current stream channel alignment would be maintained adjacent to the ore processing facility to the EFSFSR. Culverts would be used to convey the stream under facility roads and BMPs would be used during construction and operations to prevent sediment loading to the stream and protect water quality (Figure 6).

At closure, the lower segment of Garnet Creek would be restored as described in Section X.X.

East Fork of Meadow Creek (Blowout Creek)

The East Fork of Meadow Creek (EFMC), known locally as Blowout Creek, was impacted by an earthen dam failure in 1965, which resulted in severe erosion and a substantial drop in the water table and impairment of wetlands in the upper EFMC valley. The EFMC watershed continues to introduce substantial sediment loading to Meadow Creek and EFSFSR due to ongoing erosion within the gully and alluvial fan created by the dam failure.

Midas Gold would use a phased approach to rehabilitate EFMC (Figure 29). Early in the Project during mine development activities, Midas Gold would construct a French drain (Figure 30) in the gully below the former dam site to (1) decrease sediment loading from ongoing erosion of the gully side slopes, (2) reduce the potential for additional erosion of the gully bottom during high streamflow events, and (3) manage water during construction of both temporary and permanent stabilization measures. The French drain would be constructed prior to diversion of the EFSFSR into the diversion tunnel, during or prior to year 3 of construction. The drain would isolate the flow of Blowout Creek from receiving sediment inputs originating on either the eroded gully slopes or from further destabilization (downcutting) of the gully invert itself. Standard sediment control BMPs would be used to control erosion on the exposed gully side slopes.

Midas Gold would also construct grade control and water retention features near the old dam location to raise the level of the valley water table and stream base level to restore the function of approximately 20 acres of wetlands in the meadow upstream of the old dam site (Figure 37), allowing natural succession and channel evolution in the downcut portion of the stream channel within the meadow.

The French drain would be a temporary measure (during mine operations) and would be allowed to gradually fill with sediment resulting in a more desirable surface channel once the French drain becomes sufficiently impermeable. Internal baffles may be constructed with the drain to help retain sediment. If the drain has not plugged by mine closure, clean fill would be placed atop the drain to provide isolation from the restored surface channel and the drain would be disconnected from the inlet by excavating the upstream portion of the drain and replacing the drain rock with less-permeable material, or by grouting. Installation of the French drain would allow an adaptive approach to stabilization of the gully side slopes, starting with the use of sprayed nutrient/seed/binder applications (and potentially other bioengineered stabilization methods), and culminating in additional fill/regrading if needed. These efforts, in combination, would lead to a stable, sustainable solution to sediment problems in Blowout Creek.

During closure, the EFMC would be reestablished from the old dam location downstream to Meadow Creek to provide a stable and functional stream channel (Figure 30) with aquatic and riparian habitat. The existing alluvial fan located adjacent to the creek would be removed and the area reclaimed. Material from the alluvial fan would be used as a borrow source for restoring the stream channel, and for similar stream restoration efforts elsewhere on the SGP site.

Meadow Creek

The Meadow Creek valley has been heavily impacted by legacy mining-related activities, including deposition of legacy tailings and spent heap leach ore, construction and operation of ore processing (e.g., milling, smelting, and heap leaching) facilities, construction of an airstrip and other legacy infrastructure, repeated stream relocations into straight riprap-lined channels, and subsequent incomplete attempts at restoration. The stream currently flows through the center of the Project area, and development of the Hangar Flats pit and construction of the TSF and Hangar Flats DRSF would require diverting the stream around operations.

Surface water diversion channels would be used to temporarily divert Meadow Creek around the TSF, Hangar Flats DRSF, and Hangar Flats pit during mine construction, operations and active closure activities (Figure 38). The diversions would also intercept surface water and storm runoff from other minor upstream drainages, seeps, and springs on both sides of the Meadow Creek drainage. Two diversion channels would be constructed to intercept and divert water from the Meadow Creek watershed around the TSF and Hangar Flats DRSF: a main channel that would divert the Meadow Creek flow and a smaller channel that would be installed on the opposite side of the TSF to intercept and divert surface water from hillsides along the remaining TSF/DRSF perimeter. Both channels would direct flows back into the existing stream channel upstream of the Hangar Flats pit.

The main diversion channel would be constructed in phases to defer impacts to the stream and wetlands. The early-phase main diversion channel would be routed around the south side of the TSF and discharge into the existing SODA diversion channel rather than constructing a new outlet channel on the north side of the Meadow Creek valley. This diversion would remain in place in use approximately through mine year 5 or 6, by which time the ultimate diversion would be constructed at a higher elevation.

The stream diversions would consist of a rock-cut channel (Figure 40) in segments along the steep hillsides above the TSF and Hangar Flats DRSF and an excavated channel and berm (Figure 41) in segments through fill, alluvium, or colluvium. Channel segments excavated in erodible or permeable materials would be lined as required with rock riprap and/or geomembrane or a geosynthetic liner to prevent erosion and to minimize seepage.

To protect the stream and facilitate safe mining of the Hangar Flats pit, the Meadow Creek channel would be moved away from the pit toward the valley wall and reconstructed to create sustainable spawning habitat, as well as provide riparian habitat along a reconstructed floodplain feature. This bioengineered stream corridor (Figure 42) would feature a meandering channel and floodplain wetlands. The corridor would be underlain by low-permeability geosynthetic liner to minimize seepage of water from the channel into the Hangar Flats pit or its dewatering well system and the resulting potential pit wall instability or loss of stream habitat through dewatering of the stream. The diversion channel would be designed to be a fully functional stream channel that would provide valuable aquatic habitat during operations, and indefinitely if the decision is made not to connect the channel with the Hangar Flats pit at closure.

At closure, Midas Gold would reestablish the surface channel of Meadow Creek over the TSF and Hangar Flats DRSF, and down the north abutment of the DRSF into a reconstructed Meadow Creek stream channel designed to restore fisheries, wetlands, and riparian habitat as described in Section X.X.

Pit Dewatering

Development of the Yellow Pine and Hangar Flats pits would require dewatering the existing Yellow Pine pit lake and the alluvium of portions of the EFSFSR and Meadow Creek valleys ahead of mining to limit groundwater inflow to the pits and maintain stability of the pit slopes. High pore-water pressure from groundwater in alluvium or bedrock substantially reduces the geotechnical stability of these materials, thereby increasing the risk of pit wall failures, which could jeopardize worker safety, risk equipment damage, and disrupt operations.

Lowering the water table in and surrounding the Yellow Pine and Hangar Flats pit areas would increase pit wall stability and provide dry working conditions in the pit bottom; the West End pit would not require active dewatering. Midas Gold would install a series of dewatering wells in the alluvial material (present from ground surface to 100 to 300 feet below the surface at the Hangar Flats pit, shallower at the Yellow Pine pit) and shallow, fractured bedrock upstream of the pits. The number of wells required for pit dewatering would depend on results of the water balance and groundwater models.

Pit dewatering would be initiated during the mine development and construction phase. The wells would be pumped as needed to minimize groundwater inflow to the pits and maintain stable pit walls; additional pumping may occur if needed for process makeup water. Water from the dewatering wells would be pumped to different locations based on Project water demands, including (1) the ore processing facility for use in processing or other beneficial site uses, (2) the TSF for later use in ore processing, (3) RIBs located in the alluvial material downstream of Hangar Flats pit or in the backfilled areas of the Yellow Pine pit to maintain or reestablish alluvial groundwater levels, and/or (4) discharged via an NPDES outfall.

Commented [MP5]: Please clarify whether these options for pit water management will occur during construction or operations or both. Figures 2 and 3 of the site wide water balance flow diagram (which represent construction and operations water management) do not show these flow options. Instead the figures show all pit dewatering water (Hangar) going to discharge to Meadow Creek (I assume via a RIB, but that should be clarified on Figures 2 and 3) or to the contact water pond or to mill feed (Yellow Pine and West End). Figures do not show pit water going to the TSF.

Water needed for ore processing or other site uses (e.g., fire suppression, dust control, exploration) would be pumped into equalization tanks (holding tanks that allow for equalization of outflow with variable inflow) and then pumped to the freshwater/fire water head tanks that would be located east of the ore processing facility. Excess water not needed to support ore processing or other site uses would be discharged into RIBs downstream of the Hangar Flats pit (Figure 43) or discharged via an NPDES discharge point as appropriate to help balance surface water and alluvial aquifer flows.

Commented [MP6]: The final version of this document should provide the surface water flow and alluvial height thresholds that will be maintained so that it is clear when flows would be redirected.

Stormwater Management

Midas Gold would update and expand their existing Stormwater Pollution Prevention Plan (SWPPP) to address stormwater runoff at the SGP site during operations, in accordance with EPA and Idaho regulations. A primary objective of stormwater management at the SGP site would be to segregate clean stormwater runoff from stormwater that has encountered development rock, tailings, exposed pit walls, the ore processing area, and ore stockpiles. Clean “non-contact” stormwater would be diverted around the mine features and released into the stream system. Stormwater that has encountered mine facilities such as the TSF, DRSFs, pits, ore stockpiles, and ore processing area is considered contact water and would be used in the mining and ore processing operations, lost to evaporation, or discharged via NPDES outfalls after treatment to meet permit limits, if necessary.

Midas Gold would install BMPs and employ mitigation measures to reduce erosion and sediment delivery to streams. These BMPs would include sediment catch basins, runoff collection ditches, silt fencing, straw wattles, water bars, culverts, energy dissipation structures, and terraces. These features would be designed in accordance with USFS, IDEQ, and IDL requirements and would become part of the SWPPP.

Additional sediment and erosion control measures would include restoring, reclaiming, and revegetating disturbed areas as soon as practicable; temporarily stabilizing short-term disturbance areas such as road cut and fill slopes and facility construction and staging areas; and planting trees in areas of the site burned by forest fires.

Non-Contact Stormwater

Stormwater runoff from undisturbed areas upslope of mine features in the major drainages would be captured in the temporary stream and surface water diversion channels described in Section X.X and diverted around the mine features into natural drainages (Figures 5 and 6). Similar smaller scale temporary diversion channels or earthen berms would be used, where necessary, to divert stormwater around the pit highwalls, ore processing facility area, ore stockpiles, and truck shop area (Figure 6). Midas Gold would install and maintain sediment catch basins and/or energy dissipation structures at the surface water diversion outfalls, where needed. Sediment would be periodically removed from the structures and deposited in one of the DRSFs or used for reclamation soil generation.

Stormwater management would also involve managing non-contact runoff from the general infrastructure areas, haul roads, laydown yards, parking areas, building sites, and reclamation areas. Runoff from these areas would be captured in runoff collection ditches and routed in channels or through culverts to sediment catch basins where the water can evaporate, infiltrate, or be discharged into the stream system (Figures 6 and 39).

Contact Water

Contact water includes runoff from mine facilities such as DRSFs and mine pits, toe seepage from DRSFs, and underground exploration water (if these features intersect mineralized zones that introduce unacceptable levels of metals loading). Contact water would be stored and used, to the extent possible, in mining and ore processing activities as makeup water for the ore processing circuit or for dust control. Contact water that cannot be used may be treated, if necessary, to meet NPDES permit limits and discharged, or disposed of through forced evaporation.

Stormwater runoff and toe seepage from the DRSFs, ore processing area, and ore stockpiles would be captured in runoff collection channels and routed to contact water storage ponds (Figure 6). The ponds would be geomembrane-lined to prevent leakage. Water in the ponds would be pumped to the ore processing facility for reuse, treated and released to the stream system, or evaporated. Stormwater runoff in the open pit bottoms would be contained with the pit and used for dust suppression, transferred to contact water storage ponds, or allowed to evaporate.

Commented [MP7]: SWWB Flow Diagram figure 3 shows that contact water would be treated and discharged (or forced evaporation). This sentence and figure 3 should identify the NPDES outfall where this discharge would occur.

Under Section 2.3.2 Operation and Ore Processing

Water Use and Supply

Water would be needed for every phase of the Project. Surface water flowing through much of the site in streams or constructed surface water diversions would be needed to support aquatic habitat, fisheries, and riparian vegetation; therefore, Midas Gold would prioritize groundwater as the source of water for mine development and operation. Because of the remote location of the SGP site, Midas Gold would develop a water supply system to furnish potable water, along with water for fire protection, exploration, surface mining (dust control), ore processing, and tailings transport, while maintaining a sufficient supply of good quality water for the surrounding ecosystem by recycling the majority of water used in all aspects of the Project. Midas Gold would decrease the potential for groundwater withdrawals by collecting impacted stormwater runoff (contact water) and storing it in separate facilities (amount and need to be determined by ongoing modeling) for use in dust control and process water makeup.

Midas Gold has four permanent and three temporary water rights in the district (collectively, "Water Rights"), which are detailed in Table 1. Additional water rights would be secured through direct permit application and subsequent approval of such rights from the Idaho Department of Water Resources (IDWR). Preliminary hydrologic modeling estimates an additional 2.39 cubic feet per second (cfs) and 1,730 acre-feet of groundwater rights would need to be secured to support ore processing, and an additional 0.01 cfs and 10 acre-feet would be needed for potable water supply. Under certain conditions (prolonged severe drought occurring early in operations), an estimated temporary seasonal withdrawal of up to 5.63 cfs over the present water right may be required to maintain ore processing operations. Such peak withdrawals would be uncommon and limited in duration. Midas Gold plans to submit a permit application seeking a maximum diversion rate of approximately 5.63 cfs from groundwater sources to support mining and ore processing. However, as discussed below much of the water needed for ore processing would be recycled from the TSF.

Table 1. Water Rights Summary

Source: Midas Gold 2016 (Table 8-1)

Water Right ID	Type	Source	Diversion Point	Priority Date	Beneficial Use	Diversion Rate (cfs)	Max Total Usage (acre-feet)
77-7285	Ground water	Well	SE ¼ of the NE ¼, Section 15, T18N, R9E	11/7/1988	Storage and Mining	0.50	39.2
77-7293	Surface Water	Unnamed Stream (Hennessy Creek)	SW ¼ of the NE ¼, Section 3, T18N, R9E	4/19/1989	Mining	0.25	20.0
77-7122	Surface Water	EFSFSR	NW ¼ of the NW ¼, Section 14, T18N, R9E	4/16/1981	Storage and Mining	0.33	7.1

Water Right ID	Type	Source	Diversion Point	Priority Date	Beneficial Use	Diversion Rate (cfs)	Max Total Usage (acre-feet)
77-7141	Ground water	Well	SW ¼ of the SW ¼, Section 11, T18N, R9E	6/9/1981	Domestic	0.20	11.4

Table Notes:

cfs = cubic feet per second.

Table 2 shows the projected water use for the SGP as described below by type of water system and the water balance flow diagram shown on Figure 44. Actual volumes would vary seasonally and annually depending on mine phase and climatic conditions (e.g., mine inflows and outflows, precipitation and evaporation).

Table 2. Estimated Fresh and Recycled Water Usage(1) in Gallons Per Minute

Source: Midas Gold 2016 (Table 8-2)

Plan Component	Construction and Start-Up	Operations	Closure and Reclamation
Underground(2) and surface(3) exploration	50	50	0
Surface dust control (seasonal basis)(4)	208	416	104
Ore processing including tailings storage(5)	0	4,100	0
Potable or domestic use(6)	26	12	4
Sub-Total Use	**284**	**4,578**	**108**
Contingency (10%)	28	458	11
Total Estimated Use(7)	**312**	**5,036**	**119**

Table Notes:

1. Usage projections are best estimates using currently available knowledge. Operational experience would result in usage modification and optimization.
2. Underground usage mainly for dust control, washing walls, and removal of drill cuttings and cooling the drill bits.
3. Water is used to lubricate drill bits and drill rods of the exploration drill rigs.
4. Assumed that during operations two 15,000-gallon capacity water trucks apply their full water load in 1 hour for 15 to 20 hours per day during dry periods of the year. Usage is assumed to be half that of mine operations during construction, and one-fourth the operations usage during closure and reclamation. Usage would be less if chemical dust control agent is applied to roads and during the closure and reclamation period.
5. The major water use of the Plan would be for ore processing facility operations, and this value represents the estimated water usage, including recycled water; however, it is important to note that much of the water used for ore will be recycled and that this is not a consumptive use. Following initial startup, Midas Gold can begin to recycle water back to the ore processing facility from the supernatant pond and thereby reduce the amount of freshwater makeup. During operations, it is anticipated that, on average, 20% (approximately 890 gallons per minute [gpm]) of the water used in the ore processing facility would be freshwater makeup, while the remaining process water (estimated at 80% of the total) would be recycled from within the ore processing facility itself, contact water collection points, and/or

from the TSF. The total water consumed by the process averages approximately 2,300 gpm over the life of the Plan (included in the 4,100 gpm total above), and includes water entrained with the tailings, evaporated from the TSF, and evaporated or chemically combined in the process reactions.

6. Potable water demands are estimated based on 50 gallons per day (gpd) per person usage on site. Personnel estimates are rounded up to nearest five and flows measured in gpm throughout the life of the Plan are as follows:

   For initial site treatment and construction: (750 people) (50 gpd) = 26 gpm

   (24 hr/day)(60 min/hr)

   For concurrent reclamation and operations: (350 people) (50 gpd) = 12 gpm

   (24 hr/day)(60 min/hr)

   For closure and reclamation: (100 people) (50 gpd) = 4 gpm (24 hr/day)(60 min/hr)

7. Storage volumes and flow capacity would be available for fire suppression, but this water would only be used in emergency situations and is not accounted for under daily gpm values.

Potable Water

Potable water would be needed for human consumption and sanitary use at the site, in particular at the Worker Housing Facility, mine office, maintenance facility, underground facilities, and ore processing facility complex. Water demands for these usages would vary over the life of the SGP. Groundwater would be the primary source of water for potable use at the site. Midas Gold would use an existing well located near the current exploration housing facility in the EFSFSR drainage, below its confluence with Meadow Creek, to supply potable water to the mine office and other facilities at the ore processing facility, maintenance (truck shop), and surface support facilities for underground exploration. This well has a filtration and chlorination system already installed. Midas Gold expects that the existing filtration and chlorination system would continue to be used to provide potable water for the site and would be expanded to meet expected demands and to comply with IDEQ regulations for a non-transient, non-community drinking water system.

A separate wellfield drilled to a depth of 100 to 200 feet would be developed in the EFSFSR drainage adjacent to Worker Housing Facility to provide potable water for that facility. Potable water for the Worker Housing Facility would be filtered and chlorinated to make it suitable for cleaning, cooking, showering, and drinking.

Reclaim Water

Stormwater falling directly on the TSF and water from the supernatant pond that forms on the TSF surface as the tailings consolidate would be retained in the TSF and used as reclaim water for the ore processing circuit. The volume of available reclaim water will be influenced by the mine phase, precipitation and evaporation. The reclaim water would be pumped from the supernatant pond on the TSF to the reclaim water tank located at the ore processing facility. Water from the reclaim water tank would be distributed for use in the ore processing facility as needed.

Fresh water for Ore Processing

The majority of the water needed for ore processing would be recycled from the TSF (Figure 45); any addition of fresh water for the ore processing facility is known as makeup water. Makeup water would be supplied from pit dewatering wells located in the Meadow Creek drainage around the Hangar Flats pit and the EFSFSR drainage around the Yellow Pine pit. Information regarding aquifer capacity will be provided upon completion of the water balance model. The makeup water would be pumped from the dewatering wells into equalization tanks (holding tanks that allow for equalization of outflow with variable inflow) and then pumped to the freshwater/fire water head tanks to be located east of the ore processing facility site. Fresh water for the ore processing facility needs would be drawn from the freshwater tank from an elevated nozzle to allow the water in the bottom of the tank to remain available for emergency fire suppression use. These tank facilities would also have the potential to fill water trucks so that the water can be used for exploration drilling, development drilling, and road dust control, if needed. The freshwater/fire water tank would be sized to store approximately 360,000 gallons of water; 240,000 for process uses and 120,000 gallons reserved for fire suppression.

Commented [MP8]: This source of make-up water does not appear to be shown on the SWWB flow diagram figure 3.

Other Water Uses

Fire Protection

In the event of an onsite fire, Midas Gold would use water stored in the onsite freshwater tank for fire suppression. Emergency power for pumping would be available by diesel/propane generators. Water from the freshwater tank can be fed by gravity in the event of a complete power outage. Midas Gold is committed to supporting Valley County, the town of Yellow Pine and other emergency response teams as practicable. In the event of an offsite forest fire, Midas Gold would supply water to professional firefighters as available and necessary.

Dust Control

Water would be used for dust suppression (mainly on haul roads and at excavation and ore or development rock handling sites), particularly during the drier summer and autumn months. Contact water would be used for dust control on facilities that themselves produce contact water, such as the DRSFs and in-pit haul roads. In some areas, water volumes necessary for road dust suppression would be reduced by using dust control chemicals, such as magnesium chloride, lignin sulfonate, or other environmentally suitable products. When applied properly and maintained, these products can provide dust control for extended periods and significantly reducing the amount of water needed for dust control.

Exploration

Water would be used to support both surface and underground exploration activities. During surface exploration, water would be used to: lubricate drill bits and drill rods, supplement the effectiveness of drilling additives in lubricating and cooling the drill bit, provide the appropriate viscosity to assist in carrying cuttings up from the bottom of the borehole, and maintain hydrostatic pressure in the borehole. Drilling generally requires the use of water at a rate of approximately 5 to 10 gpm, depending on drilling conditions, but much of this water would come from recycling from the drill sumps or tanks. Approximately 50 gpm would be needed for dust control, washing walls, removal of drill cuttings, cooling the drill bits, and lubricating the drill bits and drill rods.

Water would be used in underground exploration activities for dust control, washing walls, and removal of drill cuttings, cooling of drill bits, and to make shotcrete or cemented rockfill material at the batch plant. Much of this water would be recycled within the underground exploration activities, thereby reducing net consumption and the need for fresh water. As needed, water would be hauled in a water truck to a storage tank at the Scout portal. Midas Gold may also install a water pipeline from the ore processing facility to a storage tank at the portal, from which a 2-inch- to 4-inch-diameter water pipe would be installed down the decline and connecting into the various drifts. Approximately 10 to 20 gpm of water would be needed to operate each jumbo drill and around 10 to 15 gpm to operate each core drill. These consumptions would vary based on bit size, rotation rates, rock conditions, penetration rates, and operator experience.

Potable water would also be necessary for showers and sanitary use in the change facility (dry) trailers, with a small amount of water being used in the office trailers and the shop facilities that support the underground exploration activities. Potable water demands are conservatively estimated to be approximately 50 gpd per person. During drier seasons of the year and as necessary, Midas Gold would use fresh water to control dust in and around the Scout portal area. Similar to surface haul road dust control, Midas Gold may use a chemical dust suppressant to conserve and minimize the use of water.

WATER TREATMENT

Water streams potentially requiring some form of treatment at the SGP would include surplus water from the pit dewatering wells, sanitary sewer effluent, contact water from stormwater runoff and DRSF toe seepage, and water from the TSF supernatant pond during closure. The specific type, size, and disposition of the treatment systems will depend on the inflow water quality and the discharge limits to be established under the NPDES permit process.

Midas Gold would treat excess water from the dewatering wells if needed to meet any applicable NPDES permit limits before discharging to the EFSFSR or into the RIBs. Components of the water treatment system design criteria would include removal of contaminants, and settling or filtration of particulates.

Primary treatment processes that would provide broad-spectrum removal of contaminants within one or more of the water streams expected at the site are iron co-precipitation, membrane bioreactor technology, and reverse osmosis membrane separation. Treatment processes that can be used as “add-ons” to selectively treat constituents of concern include chemical oxidation and absorptive media column separation.

Midas Gold anticipates using iron co-precipitation as the preferred treatment alternative for contact water and, if necessary, dewatering well water. A secondary polishing train of adsorptive media may be used to target naturally occurring low levels of mercury to levels below discharge limits as regulated by a future NPDES permit. Midas Gold may also investigate passive water treatment or bioremediation for arsenic and antimony using wetlands, organic materials, or scrap iron.

Commented [MP9]: I recommend that SWWB flow diagram Fig 3 be revised to add boxes that show the water treatment plants that occur before the oufalls. Alternately a new figure could be prepared that clearly shows water sources to each water treatment plant (WTP) and the outfalls to which treated water would flow. Does each outfall have its own WTP?

Commented [HL10]: General comment regarding water treatment. We are unclear if the site would require long-term water treatment (after 20 year post closure). We request that the WMP include a section that clearly states the WT period required and whether or not long-term/In perpetuity treatment would be needed including a summary and/or reference of the geochem analysis that supports the determination.

Commented [MP11]: This water management plan should disclose the number of WTPs that will be used and the specific water treatment processes proposed for each WTP. The WTPs should be shown on the SWWB flow diagrams. In addition, WTP flow diagrams should be provided that show the process units that will be utilized at each WTP. As this section currently reads, it is not clear what type of water treatment is planned and therefore it will be difficult in the draft EIS to evaluate the effectiveness of water treatment and ability of the project to meet water quality standards.

Sanitary sewer effluent generated at the mill, administration buildings, and truck shop would be collected in vaults and transported to the Worker Housing Facility for processing through the Worker Housing Facility wastewater treatment plant, which would use a membrane bioreactor system. Midas Gold has successfully permitted the use of this type of system for use at its exploration housing facility at Stibnite and anticipates its use in support of the SGP.

Enhanced evaporation, using snowmaker-style misters or similar technology, may be used to supplement the water treatment system, in particular to prevent surplus water accumulation in the TSF. Treatment and enhanced evaporation differ in their relative effectiveness, efficiency, usefulness in cold/wet conditions, and applicability to variable inflow water quality. A reverse osmosis membrane or similar separation system may be needed to provide additional treatment of TSF supernatant water at the end of mine life to facilitate closure of the TSF. This process could additionally use secondary treatment systems of adsorptive media to target naturally occurring levels of mercury, and chemical oxidation to target residual cyanide and metal cations like ferrous iron and thallous thallium. Alternatively, water treatment could be accomplished by passive, bioengineered means such as wetlands.

OUTFALLS

Up to five surface water outfalls are anticipated for the Project and associated with the NPDES permit (Figure 46). However, the water management associated with operational sequencing during mining is such that no more than four outfalls are anticipated to be needed during the initial 5 to 10 years of mining operations. Three of these outfalls—001 (Yellow Pine Pit), 002 (West End), and 003 (Plant Site)—would be used to discharge treated contact water from active mine pits, DRSFs, and the Plant site that, in the absence of the outfalls and associated collection ditches, would otherwise drain to surface waters.

A fourth outfall (004) would be used to discharge treated sanitary wastewater from the employee lodging facility. The Plant site may also generate treated sanitary wastewater from restroom and kitchen/break facilities, a portion of which could be discharged through one or more of the contact water outfalls (this water would be treated to reuse standards using a membrane bioreactor system). Table 3 provides a summary of the proposed outfalls. The final number and location of stormwater outfalls will be determined following selection of a preferred alternative and completion of the DEIS, and outfall locations will be identified in the Project SWPPP per the Multi-Sector General Permit (MSGP).

Table 3. Features of the Project Associated with NPDES Outfalls

Feature	Approximate Location[1]	Outfall Designation	Receiving Water	Potential Pollution Source(s)
Yellow Pine Pit and DRSF	Lat 44.9330 Long -115.3363	001	EFSFSR	contact water
West End Pit and DRSF	Lat 44.9347 Long -115.3205	002	West End Creek	contact water
Plant Area	Lat 44.9099 Long -115.3302	003	EFSFSR	contact water, possibly some reclaimed sanitary wastewater

Commented [MP12]: Recommend adding a column to this table that identifies the water treatment that would occur prior to discharge.

Commented [MP13]: I recommend that the entries in this column be expanded so that the individual waste streams are identified. For example, the first entry could read “contact water including pit dewatering water and DRSF seepage and runoff”

Feature	Approximate Location[1]	Outfall Designation	Receiving Water	Potential Pollution Source(s)
Fiddle DRSF				contact water
Hangar Flats DRSF				contact water
Dewatering of Hangar Flats Pit				natural mineralization in groundwater
Worker Housing Facility	Lat 44.8901 Long -115.3024	004	EFSFSR	sanitary waste stream
Tailings Storage Facility[2]	Lat 44.9099 Long -115.3302	005	EFSFSR	process water

Commented [MP13]: I recommend that the entries in this column be expanded so that the individual waste streams are identified. For example, the first entry could read "contact water including pit dewatering water and DRSF seepage and runoff"

[1] Specific locations will be provided in the Final EIS.

[2] Discharge, if any, is not anticipated from the TSF until very late in the mine life and during mine closure.

Contact water draining from areas located at some distance from an outfall (e.g., Fiddle DRSF, Hangar Flats DRSF) would be pumped to a location with treatment capacity and a permitted outfall (e.g., Plant site). If groundwater from the Hangar Flats pit dewatering meets surface water discharge criteria, it may be directly discharged to RIBs along Meadow Creek; otherwise, it would be treated and discharged through a special outfall to mitigate potential flow reductions in Meadow Creek during dewatering.

Commented [GC14]: Is this a 6th outfall??

The TSF is expected to be a zero-discharge facility until near the end of mine life. If unexpected conditions lead to the need to release water from the TSF during the initial permit cycle, that water would be treated by a system at the Plant site and released from Outfall 003 in accordance with its permit limits and conditions. No release of water from the TSF to surface waters would occur without prior notification of the EPA and IDEQ. Figure 15-1 in the PRO indicates an outfall location at the TSF, but because there would be a reclaim pipeline in place from the TSF to the Plant throughout the mine life, Midas Gold anticipates that any water from the TSF requiring treatment and discharge would be piped to the Plant, rather than treating and discharging water near the TSF and releasing it to Meadow Creek. Thus, Outfall 005 is depicted on Figure 46 at a location near Outfall 003 at the Plant site.

Commented [GC15]: Limited to net precip on the treatment facility – make sure application specifies this or else it couldn't legally be done.

Each outfall would be an engineered structure designed to function for the life of the mine with minimal maintenance. The structures would be adjustable to regulate the rate of discharge, with the ability to hold and store water, if necessary. Wherever feasible, the structures would be located at least 30 feet away from the edge of the natural channel of the receiving water, with a temporary swale constructed from the outfall to the stream edge. This setup would mimic a natural tributary and avoid the need to place a structure in the riparian zone or floodplain, thus maintaining the natural character of the stream edge.

Ore Processing Water Management

The primary use of water at the site would be for ore processing, including reprocessing of the legacy tailings. The largest source of that water would be reclaim water recycled from the TSF. The amount of recycled water would depend on water losses in the system, such as residual water retention within the tailings and evaporation; however, the freshwater makeup needs should stabilize to an annually consistent cycle that decreases over the life of the Project. Seasonal precipitation and temperature would influence the amount of water recycled to the ore processing facility from the TSF.

Water used for ore processing, including precipitation falling on the TSF, is known as “process water.” The ore processing facility would be operated as a closed-circuit facility; process water would be recycled within the facility and not discharged into the environment.

Recycled and makeup water would be initially added to the ore in the grinding process. Following grinding, the ore would be pumped as slurry throughout the rest of the facility, from flotation cells to leaching tanks. The tailings would be thickened to recover process water and pumped as slurry (approximately 55 percent solids and 45 percent water) to the TSF, where the tailings solids would separate from the slurry and settle and the resulting reclaim water would be returned to the ore processing facility. Some process water would naturally evaporate or remain as residual water entrained in the tailings.

Water use and management at the ore processing facility would have three stages:

1. Start-up (charging the system)

2. Normal operation

3. Closure

When the ore processing facility is first commissioned, fresh water would be used until reclaim water becomes available. During initial operations, water that accumulates in the TSF supernatant pond would be recycled to the ore processing facility as sufficient quantities become available. Snowmelt and rainfall falling on the TSF would add water to the supernatant pond, especially in the spring.

After the first year of ore processing, the freshwater makeup needs should stabilize. At this time, about two-thirds of the total water used in the process would be recycled from uses within the ore processing facility and from the TSF. However, freshwater makeup would continue to be required for ore processing throughout the life of the Project due to the evaporation and retention of residual water within the tailings. A portion of this makeup water would come from annual precipitation and spring meltwater collected within the TSF, which would be supplemented by water from pit dewatering and contact water collected from stormwater runoff within the footprint of the ore processing facility and surrounding infrastructure that would be collected and pumped to the TSF or introduced directly to the reclaim water tank at the mill.

At the conclusion of ore processing facility operations when water is no longer needed for ore processing, water remaining in the TSF supernatant pond would be evaporated or treated to the applicable NPDES discharge limits and reintroduced into the EFSFSR as described below.

Tailings Water Management

Tailings from the ore processing facility would be pumped as slurry to the TSF, where the solids and water would separate as the tailings solids settle, forming a supernatant water pond atop the settled tailings (Figure 44). As the tailings consolidate over time, some of the water that was initially entrained with the tailings would rise to the pond or report to the overliner drain system and be pumped back to the pond. An underdrain system would be installed under the TSF to prevent groundwater uplift on the liner system. Precipitation and snow falling directly on the TSF would contribute additional water to the pond. Water from the supernatant pond would be returned to the ore processing facility (reclaimed) for reuse. If excess water accumulates in the TSF, the water would first be used in ore processing; then disposed of by evaporation using mechanical evaporators (similar to snowmakers but used in warm or dry conditions); and lastly discharged, after emergency treatment to applicable NPDES permit limits, to the EFSFSR.

Sufficient freeboard in the TSF would be maintained above the normal operating pond level to store stormwater runoff from a Probable Maximum Precipitation (PMP) event assuming the diversion channels fail at the onset of rainfall, plus 4 feet of dry freeboard (including 2 feet for wave runup). The design freeboard represents 11 to 12 times the estimated 100-year flood volume, or 6 to 7 times the estimated 500-year flood volume. The TSF construction is staged (expanded at roughly 3-year intervals), with each new expansion commissioned just before the previous one is filled with tailings, so the minimum design freeboard would only be realized just before a new stage comes on line—at other times, even greater freeboard would be present as the active (fully lined) portion of the impoundment would not yet have reached its design tailings capacity.

The tailings delivery and water return pipelines would be routed adjacent to a haul road to enable pipeline monitoring and maintenance. See Figures 6 and 39 for proposed routing. In the event of power outage from the main power line, backup generation capacity would be provided to ensure that process solutions can be pumped between the process facility and TSF. In addition, the reclaim pumping system would be redundant, with at least one installed spare pump in addition to the operating pump(s). Repair parts would be stored onsite to effect immediate repair of a pipe rupture or pump failure. Spare evaporators would also be stored onsite. In the event of an unusually severe and highly improbable set of circumstances (e.g., extensive length of pipe rupture, multiple concurrent pump failures, protracted site-wide power outage, failed diversion or excessive meteoric water buildup during a time when evaporators are ineffective due to temperature or humidity), ore processing may be temporarily shut down if warranted, and repair parts or backup systems brought in from offsite.

The TSF would be designed and operated as a closed-circuit, zero-discharge facility meaning that no water would be discharged to the environment (subject to limited exceptions allowed under existing regulations if applicable and needed). As such, and because of the large freeboard allowance described above, the TSF would not have an emergency spillway. As the supernatant water clarifies (tailings solids settle), Midas Gold would recycle water from the supernatant pond to the ore processing facility. Some makeup water would be required for ore processing due to evaporative losses from the supernatant pond and retention of residual water within the tailings (Figure 44). Seasonal precipitation and temperature would also play a role in the amount of water recycled to the ore processing facility from the TSF. Makeup water would only be added as required to balance the ore processing need and the supernatant pond would generally be managed to maintain an annual balanced condition, minimizing or eliminating any year-over-year increase in the dry season pond volume.

Seepage and surface runoff from the TSF embankment (integral with the Hangar Flats DRSF starting very early in operations) would be collected and routed to lined contact water ponds located on the valley bottom below the Hangar Flats DRSF toe. The contact water would be reused in the process to the extent possible, used for dust control, or pumped back to the TSF.

As mining nears completion, as much water as practical would be drawn from the TSF, and less makeup water would be added to the system, thereby reducing the size of the supernatant pond. Upon conclusion of ore processing facility operations, any remaining ponded water in the supernatant pond would be removed via natural or enhanced evaporation or treated to the applicable NPDES limits and discharged to the EFSFSR, prior to final closure and reclamation of the TSF.

Underground Water Management

EFSFSR Tunnel

During construction of the EFSFSR tunnel, three sources of water associated with tunnel construction would need to be addressed: (1) groundwater inflows into the tunnel, (2) water used for tunnel construction (production water), and (3) stormwater runoff from portal and staging areas disturbed by construction activity. These three sources of water may commingle during construction and would be managed in accordance with applicable laws, regulations, and permits.

Groundwater would enter the tunnel from the surrounding rock and soil, and mix with water used during construction (production water) to control dust, lubricate drills, and wash tunnel walls and excavated muck.[1] Groundwater inflows and production water may need to be managed to: (1) improve ground stability and minimize ground movements, (2) prevent possible adverse impacts to the groundwater regime around the tunnel, (3) prevent adverse impacts on the quality of the final lining/support, and (4) protect water quality in the EFSFSR. Groundwater inflow into the tunnel would occur through joints or faults and shear zones. The inflow quantity is primarily a function of the spacing, width, orientation, infilling and interconnectivity of the joints, fractures, and shear planes, and the effective hydrostatic pressure at the tunnel depth. Groundwater would flow naturally into the tunnel sidewalls, be diverted to the tunnel drainage ditches, and flow by gravity, or by pumping if necessary, to the portal for delivery to onsite water management facilities.

Most of the tunnel would be below the local groundwater table, and minor groundwater inflows are expected throughout the alignment. Most of these inflows would not require special water management consideration. More significant inflows are expected near the transitions from soil to rock near the portals, within the zone of shallow rock cover at the north end of the alignment, and within the Hennessy Shear Zone and Meadow Creek Fault Zone. These zones may require more attention to management of water inflow. Considering the local groundwater conditions (relatively low head and low permeability rock mass), the tunnel is anticipated to impact near-field groundwater only, and is not expected to impact far-field groundwater flow patterns. Under existing conditions, groundwater moving

[1] Muck is the rock and soil removed from the tunnel during construction.

through the rock and soil along route of the future tunnel flows to the EFSFSR, and the same would be the case after construction of the tunnel, although the flow path would be shortened where the tunnel intersects conduits (fractures/joints) in the rock.

Table 4 summarizes tunnel inflow estimates during construction. Peak heading inflows (instantaneous or flush flows) would occur when the tunnel excavation encounters faults, shear planes or fractured zones with stored groundwater. The estimates do not include the contribution from production water (dust control, muck and wall washdown, etc.), as it is assumed is that production water would be sourced from collected tunnel inflows, recycling a portion of the inflow stream for construction use rather than adding additional water. These estimates are based on hydraulic conductivity testing and groundwater observations by others during the various subsurface explorations at the site.

Table 4. Maximum Tunnel Inflow Estimates
Source: McMillen Jacobs 2018c.

Description	Groundwater Inflow (gpm)
Peak Inflow (at heading)	100
Peak Flow (at portal)	350
Sustained Inflow (at portal)	250
Average/Sustained Production Water Usage (total, sourced from inflows)	10

1 heading = upstream tunnel opening at the surface.

2 portal = tunnel opening at the surface (downslope end or exit).

It should be noted that inflow estimates are very sensitive to variations at the high end of the permeability range. These variations can be influenced by unknown reaches of high permeability rock or by a single feature such as a shear plane or open joint. The estimates for tunnel inflow do not account for the uncertainty of encountering local zones of higher permeability. These isolated features could result in local, short duration inflows of several hundred gallons per minute (gpm) if not pre-drained. When necessary to evacuate such water to reduce ponding and allow tunnel construction to proceed, it would be diverted to the tunnel drainage ditches and flow by gravity, or by pumping[2] if necessary, to the portal for delivery to onsite water management facilities. Conversely, if tunnel inflows prove insufficient to meet construction water needs within the tunneling operation, water would be withdrawn from Hennessy Creek or the Gestrin well, both of which are points of diversion for Midas Gold's existing water rights. Shotcrete and concrete would be produced at a batch plant on site, which would similarly obtain

Commented [GC16]: Specifically where would this water go?

[2] Most of the tunnel would be constructed as an incline, from the downstream (north) end upstream, and water would flow by gravity from the heading to the north portal. The lesser portion of the tunnel (particularly soft-ground [soil] tunneling at the south portal) would be constructed as a decline (advancing downstream/north) and would therefore require pumping.

water from existing Midas Gold water rights. Overall, the groundwater inflow estimates are within the typical range for tunnel construction, and no special measures are anticipated for groundwater control.

A number of BMPs are typically used to minimize or control groundwater inflow during tunnel construction. These include:

- Pre-excavation probing to anticipate the inflow and dewatering specific conductive zones prior to excavation
- Use of the probe holes as effective pre-drains to reduce hydrostatic head around the tunnel face
- Perimeter grouting to effectively seal off the tunnel area of influence
- Tunnel support systems with groundwater control properties, and
- Planning and implementation of production water and groundwater management systems.

Groundwater and production water inflows into the tunnel would generally drain by gravity to the north portal, where the water would be evaluated prior to discharge into the EFSFSR. Some water would be pumped from the south heading during soft-ground tunneling at the south portal. Construction water inflows would generally be turbid and could be contaminated with suspended solids particles, hydraulic fluid residue, small amounts of oil, grease and fuel, low levels of nitrates, as well as pH fluctuations due to cement in grout, shotcrete, and concrete. The water may also contain traces of natural metals dissolved as the groundwater passes through mineralized zones in the bedrock. Consistent with Idaho water quality standards, water from the tunnel during construction having turbidity more than 5 Nephelometric Turbidity Units above the background turbidity in the EFSFSR would not be discharged to the river. Also, water with a visible oil sheen or petroleum odor would not be discharged to the river.

Commented [GC17]: Above it says it would go to the water mgt system – this water is being used or contacting an industrial process so it would need to be permitted to be discharged

Water not meeting the turbidity or visual/odor criteria above would be managed to prevent its introduction to natural surface waters. This may include gravity flow or pumping to an excavated pond for storage and/or infiltration. Standardized BMPs would be employed to minimize the potential for construction site water quality impacts, and may include settling basins, infiltration basins, oil-water skimmers, sand filter socks, polymer flocculants, etc.

Groundwater monitoring, groundwater modeling, and geologic modeling to date suggest that groundwater flow is generally downslope across the tunnel toward the EFSFSR and the most mineralized zones in the Yellow Pine deposit (BC 2017, 2018c). Mineralized and disturbed area (and hence sources of metals and other contaminants in groundwater) are more limited upgradient of the tunnel compared to downgradient of the Yellow Pine pit area (BC 2017), and hence high contaminant concentrations are not anticipated in the tunnel.

As discussed above, water traversing the tunnel corridor naturally reports to the EFSFSR under present conditions so metals loading, if any, from water that would become tunnel inflow is presently entering the EFSFSR as diffuse inflow in the reach that the tunnel will divert, along with other diffuse inflow from portions of the Yellow Pine deposit farther east that will be dewatered in advance of pit development, cutting off those load sources to the EFSFSR. Furthermore, disconnection of Hennessy Creek from its present course though legacy development rock dumps would provide an immediate water quality

Commented [GC18]: Having it enter through the groundwater system is different than intercepting it in a tunnel that is being excavated and being commingled with other waters being used for industrial purposes – like contacting blasting agent and perhaps drilling muds benefit to the EFSFSR. The extent and concentration of metals in groundwater would be assessed in more detail during the next design phase exploration to characterize the natural background metals concentrations. These results would be used to determine if dissolved metals or other substances pose a potential risk to surface water quality if discharged directly to the EFSFSR during construction even when the water meets the turbidity and visual/odor criteria noted above. If test results indicate substantive concern over increasing the levels of metals or other potential pollutants above existing background conditions, a more detailed tunnel water management protocol would be developed.

Stormwater runoff from the construction staging areas and hillsides surrounding the tunnel portals would be managed as construction stormwater using standard BMPs (see Section X.X) and would be prevented from commingling with the tunnel water.

Scout Prospect

Midas Gold would conduct underground exploration activities to explore and evaluate the Scout Prospect, a mineralized zone east of the EFSFSR near the proposed process plant, and inaccessible by surface mining methods. The Scout Prospect would be accessed from a decline, with decline portal located south of the ore processing facility (Figure 6). Midas Gold would install underground sumps, tanks and pipelines to collect and pump water from the underground workings to provide for safe and efficient operations. Water inflow to the underground workings is expected to be variable, consistent with a fracture flow hydrology of meteoric water. Drilling would be used to test areas in advance of underground exploration development to ensure unexpected or unmanageable water pressures are not intersected. Water would be utilized in the underground drilling or pumped from the collection point to the surface through pipelines in the decline and/or in main ventilation/escape raise. Upon reaching the surface, this water would be piped to the ore processing facility.

Under Section 2.3.3 Final Reclamation and Closure

Yellow Pine Pit

Upon cessation of mining activities at the Yellow Pine pit, Midas Gold plans to backfill the pit with West End pit development rock to reestablish the EFSFSR valley (Figure 47). Once the backfill is complete, Midas Gold would reconstruct the EFSFSR channel and floodplain across the backfill to restore the EFSFSR with a longer, lower-gradient channel with higher intrinsic potential for Chinook salmon and steelhead spawning and rearing than the channel that exists presently. West End pit development rock is deemed to be the best quality material to backfill the Yellow Pine pit due to its geologic characteristics: high carbonate, non-acid generating, and low sulfide content. The reconstructed floodplain corridor would be geosynthetically lined (e.g., HDPE, LLDPE, GCL) to prevent loss of water into the pit backfill.

Through the backfilled area, Midas Gold would construct a sinuous channel for the reconstructed EFSFSR with an average valley gradient of approximately 4.6 percent; because of the curvature (sinuosity) of the channel, the restored channel would have an average slope of approximately 3.8 percent. To

Commented [GC19]: Where is this water directed?

Commented [MP20]: [Related to Cindi's question and might answer] However, the SWWB flow diagrams do not show this source of water to ore processing. This should be added to the flow diagram.

Commented [MP21]: Overall this section needs clarity on whether or not water treatment and discharge (under NPDES) will be needed at closure and post-closure and for how long. I recommend adding a table similar to Table 3 that identifies sources, outfalls, receiving waters, and adding columns that specify the treatment process and time frame (estimated years) that treatment and discharge would occur.

accommodate migrating salmon and bull trout, Midas Gold would establish step pools, resting and shelter areas comprised of rock sills within this reconstructed channel. The vertical relief (drop) between successive pools would be approximately 6 to 18 inches to promote fish passage. The area along the reconstructed channels would be seeded and planted to improve wetland and riparian habitat. The riparian plantings of grasses and shrubs, particularly willows, would provide partial cover to the reconstructed channel. Once the EFSFSR is reestablished atop the backfilled Yellow Pine pit, Midas Gold would permanently close the tunnel (Figure 48). Following completion of Yellow Pine pit closure activities, Hennessy Creek would cascade over the west highwall (approximately 275 feet tall) of the Yellow Pine pit to a section of low-gradient channel on the edge of the reconstructed EFSFSR floodplain before joining the reconstructed EFSFSR channel. Midnight Creek would be reestablished across the reconstructed EFSFSR floodplain to provide additional fish habitat.

Commented [GC22]: How would groundwater infiltration into the tunnel stopped so the tunnel could be closed?

Elimination of Water from TSF Supernatant Pond

As the mine approaches the end of its operating life, when ore processing is nearly complete, Midas Gold would gradually eliminate excess water within the TSF supernatant pond (by reclaiming for use in the ore processing, and by forced evaporation of the excess) so that minimal water remains when the final tailings are pumped into the TSF. To the extent practicable, the final tailings deposited during operations would be used to develop the post-closure TSF landform surface by selectively depositing tailings to fill low spots in the TSF surface, maximize use of the TSF storage capacity, and develop an overall down-valley gradient on the TSF surface.

Upon conclusion of ore processing operations, any remaining ponded water in the supernatant pond would be removed. Removal of the remaining water from the TSF would allow the surficial layers of the tailings to dry and gain strength, which would, in turn, allow equipment to operate on the tailings surface for grading and the placement of a soil/rock cover. The water may evaporate naturally or via enhanced evaporation using mechanical evaporators as part of final closure activities. If enhanced evaporation efforts do not adequately reduce the pond volume, water treatment to meet applicable discharge limits would be used as discussed in Section X.X to eliminate the supernatant pond and facilitate reclamation of the TSF. Treated water that is compliant with discharge limits would be directed to the EFSFSR as a surface discharge and/or to alluvial groundwater via RIBs.

Commented [MP23]: Specifically, what type of water treatment would be used and where would the water treatment plant be located (or would the operations WTP be used)?

Commented [GC24]: Through Outfall 005?

At or near the end of the operational phase of active tailings placement, Midas Gold would undertake a consolidation analysis of the tailings to better understand tailings consolidation and densities. Midas Gold could then adjust cover design and placement to account for expected or observed settlement as the facility is dewatered and the tailings consolidate.

Tailings Storage Facility and Hangar Flats DRSF

When tailings are sufficiently consolidated to allow for equipment traffic, Midas Gold would conduct minor grading of tailings and begin to place and spread a layer of rock over the top of the portions of the tailings surface to enable equipment access and provide positive post-closure drainage from the facility so that surface water sheds off the tailings rather than ponding. The soil-rock cover discussed below would be placed after or concurrently with the initial rock placement, depending on location within the facility. The grading and cover placement atop the TSF and the Hangar Flats DRSF would establish a corridor for the reconstruction of Meadow Creek. Midas Gold would restore stream channels (Meadow Creek and tributaries) within a synthetically lined corridor (e.g., HDPE, LLDPE, or GCL) across the top of the TSF and DRSF. This would allow for the post-closure development of riparian habitat, convey water off the facility, and minimize potential interaction of surface water with the tailings.

POST-CLOSURE SURFACE WATER MANAGEMENT PLAN FOR TSF AND HANGAR FLATS DRSF

Once grading is completed on the TSF and the adjoining, down-gradient Hangar Flats DRSF, and cover material is placed on the TSF, Midas Gold would implement the post-closure surface water management system for both facilities (Figures 49 and 50). With final closure and reclamation of the TSF, the surface water channels around the TSF would be decommissioned and the up-drainage stream segments in the Meadow Creek watershed that were diverted during operations would be reconnected to the restored sections atop the TSF. A meandering channel would be constructed across the top of the TSF within a synthetically lined corridor with a series of pools, riffles, and gravel areas. Given the nature of the surface of the TSF, the reconstructed channel would have a shallow gradient (typically 1 percent or less).

Commented [GC25]: Will cover material be placed over both piles or just in the area of the reconfigured stream? An overall cover would reduce infiltration thus minimizing seepage over time.

The overall channel and floodplain would be designed to accommodate high-flow events. Outward from the channel, Midas Gold would create benches to convey higher water flows in the event of a major flood. Midas Gold would also establish “off-channel” fish habitat areas in side channels or oxbows, and provide fish habitat structures throughout the area, comprised of boulders and boulder clusters, root wads, and large woody debris.

Midas Gold would incorporate wetland benches with a series of succession species; the closest to the channel being the most water dependent. Additional wetland and stream reclamation details can be found in the Draft Conceptual Stream and Wetland Mitigation Plan (Tetra Tech 2018). The riparian plantings of grasses and shrubs, particularly willows, would provide cover to the channel.

The Hangar Flats DRSF out-slope would be graded to a final overall slope of approximately 3 (horizontal) to 1 (vertical), although slopes at the toe of the facility may be shallower to produce concave features to mimic natural topography that would conform to and blend with the surrounding terrain, as well as to produce a permanent and stable landform. Midas Gold would continue the lined channel and floodplain corridor for Meadow Creek from the TSF across the top of the reshaped DRSF. Along the north abutment of the DRSF, reconstructed channel would be lined with rock, designed for energy dissipation on the steeper slope. Similar to the TSF, Midas Gold would plant a succession of plantings along the channel, including a variety of grasses and shrubs, particularly willows, to provide cover to the channel.

HANGAR FLATS PIT

The Hangar Flats pit would remain open at closure to function as a permanent sedimentation basin downstream of the TSF, Hangar Flats DRSF, and Blowout Creek, much like the current Yellow Pine pit does (to a reasonable extent) today. The pit would gradually fill with a combination of surface water runoff and groundwater flows from the thick alluvium surrounding the pit, and once full, spill continuously to Meadow Creek. Ultimately, the steady-state water level is expected to be very near the elevation of the surrounding land. Roughly the year prior to the spillover, Midas Gold would construct an outlet channel to connect the pit lake to lower Meadow Creek in preparation for the outflow (Figure 51).

Commented [MP26]: This assumes that pit water quality meets water quality standards, which should be demonstrated in the EIS. If pit water quality is predicted to not meet standards, or if there is uncertainty, then the plan should include water treatment and maintenance of an NPDES outfall post closure.

Upon final cessation of mining activities, surface water runoff from the TSF, the Hangar Flats DRSF, and Blowout Creek would be routed to the Hangar Flats pit, which would serve as both habitat and a “sediment trap” prior to water flowing from the pit downstream into Meadow Creek. Continual freshwater flow into the open pit will also help promote lake turnover and prevent evaporation concentration of the lake water. Midas Gold would also implement riparian reclamation activities around the fringes of the southern portion of the Hangar Flats pit within the Meadow Creek and Blowout Creek floodplain.

Downstream of the Hangar Flats pit to the confluence with EFSFSR, the existing Meadow Creek channel would be enhanced through the strategic placement of large woody material, minor regrading of the channel (limited to the addition of constructed riffles, alcoves, side channels, and deep pool fish habitat), and floodplain regrading.

West End Pit and DRSF

Development rock from the West End pit would be used to backfill the Yellow Pine pit and a portion of the West End pit. At the end of mining, the West End pit will include the main pit area and a small depression at the southern end of the pit referred to as the Midnight Area of the West End pit. To facilitate final closure and post-closure water management of the West End pit area, a flexible management strategy would be employed throughout the mine life to ensure that the best final pit configuration, DRSF configuration, channel design, and water quality considerations are emplaced for physical and chemical stability of mine related features.

Once the West End pit is mined out, wetlands will be constructed on the surface of the reclaimed West End DRSF, fed by flows from the restored West End Creek. West End Creek flows exiting the reclaimed DRSF area will report to the West End open pit. A lake is anticipated to form in the pit from surface runoff from the surrounding catchment, groundwater inflow, and direct precipitation. The pit lake would be up to 400 feet deep and take approximately 41 years to fill based on preliminary modeling estimates, after which the lake would only spill over for short seasonal periods (BC 2018a). The lake would provide permanent storage for sediment generated from the existing upper West End legacy development rock facility, West End DRSF, and from the exposed pit highwalls. The anticipated sediment load has not been calculated, but the pit lake will have an initial volume (7,100 acre-feet before receiving sediment) well in excess of the historical Yellow Pine pit (approximately 400 acre-feet circa 1953). In addition, much of the disturbed area within the contributing watershed would be reclaimed and revegetated thereby significantly reducing sediment loading.

Commented [MP27]: Will all the west end DRSF material be backfilled into the pit? If not, how will seepage be managed at and following closure? SWWB flow diagram Figure 4 shows it being treated and discharged.

Precipitation and surface runoff would result in another small lake forming in the southern portion of the pit, referred to as the Midnight Area pit lake. Unlike the West End pit lake, there would be no surface stream inflow to the Midnight Area pit lake. The pit lake would be up to 100 feet deep and take approximately 10 years to fill based on preliminary modeling estimates, after which the lake would discharge to Midnight Creek only during spring runoff (BC 2018a).

Midas Gold would include an overflow spillway for the West End pit to channel water from the lake into lower West End Creek. The spillway would be founded in bedrock; however, if portions of the upstream or downstream channel are founded in development rock, it would be synthetically lined to limit infiltration through the existing lower West End legacy development rock dump. The spillway would be capable of safely passing a PMP storm event. The spillway outlet would be armored, if necessary depending on rock quality encountered at the site, to prevent headcutting.

Commented [MP28]: Same comment as above for Hangar Flats pit lake. Discuss estimated water quality of the Midnight Area and West End pit lakes and whether water treatment will be needed. If water treatment is needed, then describe the treatment process and estimate of how long treatment will be needed.

Midas Gold would use an adaptive management approach for this facility that focuses on ongoing monitoring and observation of diversion flows, groundwater inflows, dewatering flows, and sediment yield for the operating pit, to improve predictions of ultimate water inflows at closure and whether the pit will fill and continually spill, seasonally spill, or rarely spill. Current estimates suggest the lake will eventually fill and spill only during short periods in wetter years.

Midas Gold would grade the top and slopes of the West End DRSF to promote positive drainage. Runoff water from West End Creek would be routed into a constructed wetland on top of the DRSF, with the overflow routed around the northeast side of the DRSF in a designed synthetically lined (e.g., HDPE, LLDPE, or GCL) surface water channel to prevent seepage into the DRSF.

Midas Gold would reshape the DRSF out-slopes by grading to a final overall slope of approximately 3H:1V, although slopes at the toe of the facility may be shallower to produce concave features to mimic natural topography. The goal of grading and contouring would be to produce a final topography that blends with the surrounding terrain and creates a permanent and stable landform. The surface of the West End DRSF would be seeded to mitigate sediment generation. Riparian plantings of grasses and shrubs, particularly willows, would provide cover to the reconstructed channel to provide riparian habitat, keep water shaded and cool, and stabilize the landform.

The top surface of the lower existing/legacy West End development rock dump would be regraded to facilitate creation of a durable spillway, and a riprap-lined channel would be constructed on the surface for long-term water management in the event the future West End pit lake overflows.

Fiddle DRSF

Commented [MP29]: This section should describe how long collection of DRSF seepage will occur at closure/post-closure and whether the seepage will require water treatment. If treatment will be required, then provide a description of the proposed water treatment. SWWB flow diagram figure 4 shows this seepage being treated and discharged (but does not describe the treatment or whether the discharge would occur).

As part of construction, closure and final reclamation, Midas Gold would shape and grade the top surface of the Fiddle DRSF to promote positive drainage and to prevent pooling of water on the facility. A synthetically lined channel and floodplain corridor would be constructed across the top of the reshaped DRSF to prevent seepage into the DRSF. Riparian plantings would provide cover to the reconstructed channel, provide riparian habitat, keep water shaded and cool, and stabilize the landform.

The DRSF out-slope would be graded to a final overall slope of approximately 3H:1V, although slopes at the toe of the facility may be shallower to produce concave features to mimic natural topography that would conform to and blend with the surrounding terrain, as well as to produce a permanent and stable landform. The lower portion of the DRSF would be seeded to mitigate sediment generation and migration. The steeper reconstructed stream channel on the abutment/groin of the DRSF would be lined with rock, designed for energy dissipation on the steeper slope. Similar to the Hangar Flats DRSF, Midas Gold would plant a succession of plantings along the channel, including a variety of grasses and shrubs, particularly willows, to provide cover to the channel.

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Figures

Commented [HL30]: As stated earlier in a comment. Please include all of the figures relevant to the review of this document.

Figure 2	Stibnite Gold Plan of Operations Site-Wide Water Balance Flow Diagram, Construction, Mine Year -1
Figure 3	Stibnite Gold Plan of Operations Site-Wide Water Balance Flow Diagram, Operations, Mine Year 7
Figure 4	Stibnite Gold Plan of Operations Site-Wide Water Balance Flow Diagram, Closure, Mine Year 18
Figure 5	Figure 8-1 from the PRO (or similar)
Figure 6	Figure 10-2 from the PRO (or similar)
Figures 7-26	Figures 1-20 from RFAI 57
Figures 27-28	Diagrams 1 and 2 from RFAI 57
Figure 29	Figure 8-6 (plan view) from the PRO (or similar)
Figure 30	Figure 8-6 (detail A) form the PRI (or similar)
Figure 31	Figure 14-1 from the PRO (or similar)
Figure 32	New figure focusing on the Fiddle DRSF (or use Figure 8-1 from the PRO)
Figure 33	New figure focusing on the West End DRSF and pit (or use Figure 8-1 form the PRO)
Figure 34	New figure similar to Figure 14-6 from the PRO (or similar)
Figure 35	New figure (or add detail to Figure 8-1 from the PRO)
Figure 36	New figure (or use Figure 8-1 from the PRO)
Figure 37	Detail sheet 4 from RFAI 70 (or similar)
Figure 38	Figure 11-1 from the PRO (or similar)
Figure 39	Figure 8-3 from the PRO (or similar)
Figure 40	Figure 11-2 (detail B) from the PRO (or similar)
Figure 41	Figure 11-2 (detail A) from the PRO (or similar)
Figure 42	Figure 11-2 (detail C) from the PRO (or similar)
Figure 43	Figure 8-3 from the PRO, adjusted to focus on the RIBs (or similar)
Figure 44	Figure 8-7 from the PRO (or similar)
Figure 45	Figure 8-8 from the PRO (or similar)

Figure 46	New NPDES outfall figure (BC)
Figure 47	Figure 14-6 from the PRO (or similar)
Figure 48	Figure 14-1 from the PRO (or similar)
Figure 49	Figure 14-3 from the PRO (or similar)
Figure 50	Figure 14-5 from the PRO (or similar)
Figure 51	Photo in RFAI 57a (or similar)